

FREQUENCY SYNTHESIZERS, SIGNAL GENERATORS

Anritsu

SYNTHESIZED SWEEP/SIGNAL GENERATOR

69A, 68B series

10 MHz to 65 GHz



A microwave synthesizer for any application

Anritsu Wiltron's El Toro microwave synthesizers present 80 models, providing you the right synthesizer for your LO duty, component analysis, signal simulation, or A.T.E. applications. The 69A family, with the lowest Single Sideband (SSB) phase noise available, provides the ultimate performance at moderate cost, and includes models with unprecedented 0.01 to 65 GHz frequency coverage.

Features

- 120 models for perfect fit to any application
- Ultra-low SSB phase noise; -100 dBc at 10 kHz offset from 10 GHz
- 0.01 to 65 GHz frequency coverage in a single coaxial output
- Waveguide extensions to 110 GHz
- Economical upgrades
- +17 dBm maximum power, -125 dBm minimum power
- Internal AM, FM, ϕ M, pulse modulation
- User down-loaded complex modulation

Applications

• CW stimulus

The 69000A/68000B Synthesized CW Generators feature 10 MHz to 65 GHz frequency coverage. CW or step sweep, low SSB phase noise and spurious signals, output levels to +17 dBm, and optional 0.1 Hz resolution combine to make these sources ideal for local oscillator replacement applications. To meet requirements that expand over time, economical upgrades are available to any higher performing model. For the most demanding CW requirements, the 69000A and 68000B provide the ultimate in performance.

• Swept measurements

The 69100A/68000B Synthesized Sweep Generators feature 10 MHz to 65 GHz analog, step, and manual sweep capability. Output levels to +17 dBm and optional 0.1 Hz resolution are available at prices comparable to CW only sources. To meet requirements that expand over time, economical upgrades are available to any higher performing model. Features, performance, and value combine to make the 69100A and 68100B the optimum sources for your network analysis and swept A.T.E. source applications.

• High performance modulation for signal simulation requirements

The 69200A/68200B Synthesized Signal Generators provide AM and FM via external modulating signals or internal arbitrary waveform generators. The internal generators offer 7 modulating waveforms, including Gaussian noise, as well as user-defined arbitrary waveforms. Pulse modulation parameters can be set externally or by the internal pulse generator. Doublet, triplet, or quadruplet pulses make RADAR blind spot testing easy. Simultaneous synchronized modulations let you set complex signal scenarios across the entire 10 MHz to 65 GHz frequency range.

• Complete synthesized modulation and sweep capabilities for any signal requirement

The 69300A/68300B Synthesized Sweep/Signal Generators provide all the capabilities of our CW generators, sweep generators, and signal generators in a single package. The 69300A is the highest performance universal synthesized signal generator available today.

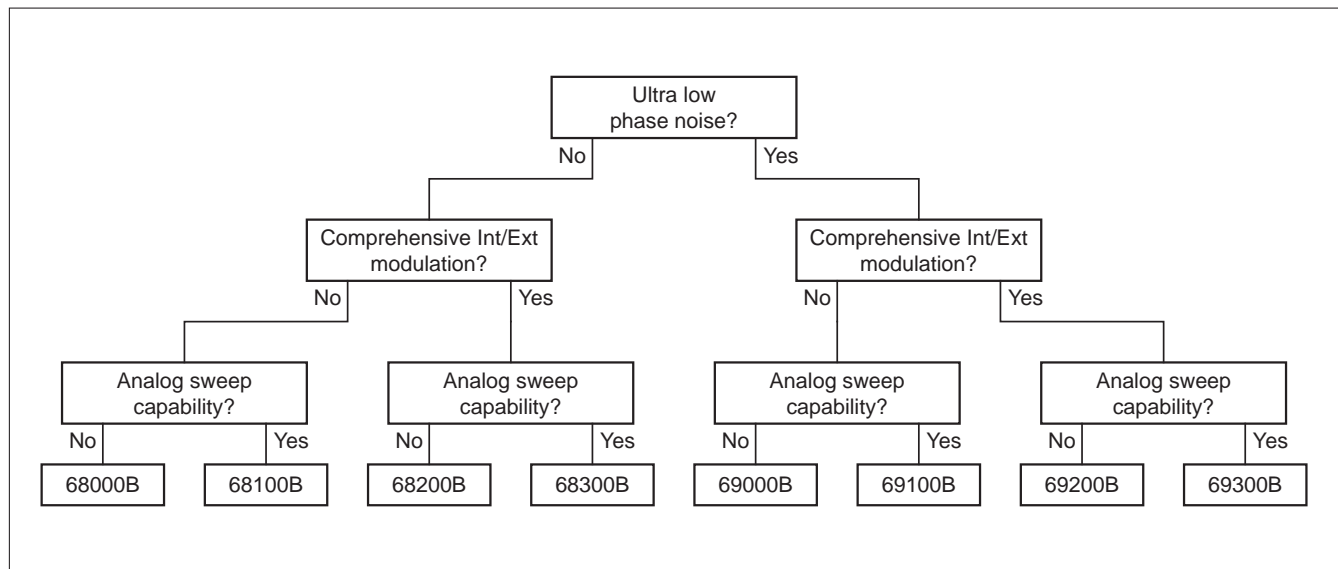
EI Toro synthesizers product selection table

| Model | 68000B | 69000A | 68100B | 69100A | 68200B | 69200A | 68300B | 69300A |
|------------------------|--------|--------|--------|--------|---------|---------|---------|---------|
| Ultra low ϕ noise | | √ | | √ | | √ | | √ |
| Step sweep | √ | √ | √ | √ | √ | √ | √ | √ |
| Analog sweep | | | √ | √ | | | √ | √ |
| Power sweep | √ | √ | √ | √ | √ | √ | √ | √ |
| Alternate sweep | √ | √ | √ | √ | √ | √ | √ | √ |
| Master/slave | √ | √ | √ | √ | √ | √ | √ | √ |
| AM | | | Ext | Ext | Int/Ext | Int/Ext | Int/Ext | Int/Ext |
| FM | | | Ext | Ext | Int/Ext | Int/Ext | Int/Ext | Int/Ext |
| ϕ M | | | | | Opt. 6 | Opt. 6 | Opt. 6 | Opt. 6 |
| Pulse modulation | | | Ext | Ext | Int/Ext | Int/Ext | Int/Ext | Int/Ext |
| AM scan (1 to 20 GHz) | | | | | Opt. 20 | Opt. 20 | Opt. 20 | Opt. 20 |
| Internal power meter | | | | | Opt. 8 | Opt. 8 | Opt. 8 | Opt. 8 |
| 360B SS Mode | | | √ | √ | √ | √ | √ | √ |

EI Toro family model summary

| | 68000B CW Generator | 69000A*1 CW Generator | 68100B Sweep Generator | 69100A*1 Sweep Generator | 68200B Signal Generator | 69200A*1 Signal Generator | 68300B Sweep/Signal Generator | 69300A*1 Sweep/Signal Generator |
|------------------|---------------------------|-----------------------------|------------------------------|--------------------------------|-------------------------------|---------------------------------|-------------------------------------|---------------------------------------|
| 2 to 20 GHz | 68037B | 69037A | 68137B | 69137A | 68237B | 69237A | 68337B | 69337A |
| 0.5 to 20 GHz | 68045B | 69045A | 68145B | 69145A | 68245B | 69245A | 68345B | 69345A |
| 0.01 to 20 GHz | 68047B | 69047A | 68147B | 69147A | 68247B | 69247A | 68347B | 69347A |
| 2 to 26.5 GHz | 68053B | 69053A | 68153B | 69153A | 68253B | 69253A | 68353B | 69353A |
| 0.01 to 26.5 GHz | 68059B | 69059A | 68159B | 69159A | 68259B | 69259A | 68359B | 69359A |
| 2 to 40 GHz | 68063B | 69063A | 68163B | 69163A | 68259B | 69263A | 68363B | 69363A |
| 0.01 to 40 GHz | 68069B | 69069A | 68169B | 69169A | 68265B | 69269A | 68369B | 69369A |
| 0.01 to 50 GHz | 68077B | 69077A | 68177B | 69177A | 68277B | 69277A | 68377B | 69377A |
| 0.01 to 60 GHz | 68087B | 69087A | 68187B | 69187A | 68285B | 69287A | 68377B | 69387A |
| 0.01 to 65 GHz | 68097B | 69097A | 68197B | 69197A | 68297B | 69297A | 68395B | 69397A |

*1: Complete performance specifications for 69A synthesizers are available in the 69A Series Synthesizers Technical Data Sheet, part number 11410-00175



Specifications

| | | | | | | | | | | | | |
|--------------------------------|--|--|---|--|--|------------------------|------------------------|------------------------|---------------------------------------|---------------------------------------|--|--|
| Frequency | CW mode | Output | Twenty independent, presettable CW frequencies (F0 to F9 and M0 to M9) | | | | | | | | | |
| | | Accuracy | Same as internal or external 10 MHz time base | | | | | | | | | |
| | | Internal time base stability | With aging: $<2 \times 10^{-8}/\text{day}$ ($<5 \times 10^{-10}/\text{day}$ with Option 16) With temperature: $<2 \times 10^{-8}/^{\circ}\text{C}$ over 0°C ($<2 \times 10^{-10}/^{\circ}\text{C}$ with Option 16) | | | | | | | | | |
| | | Resolution | 1 kHz (0.1 Hz with Option 11) | | | | | | | | | |
| | | Switching time | <40 ms to be within 1 kHz of final frequency (typical maximum) | | | | | | | | | |
| | Analog sweep mode (69100A, 69300A) | Sweep width | Independently selected from 1 MHz to full range continuous sweep. For $\ast 100$ MHz sweep width, the start, stop and bandswitching frequencies are phase-lock-corrected during sweep. For ≤ 100 MHz widths, the center frequency is phase-lock-corrected. | | | | | | | | | |
| | | Accuracy | The lesser of ± 30 MHz or (± 2 MHz widths) for sweep speeds of ≤ 50 MHz/ms | | | | | | | | | |
| | | Sweep time range | 30 ms to 99 seconds | | | | | | | | | |
| | Phase-locked step sweep mode | Sweep width | Independently selected, 1 kHz (0.1 Hz with Option 11) to full range. Every frequency step in sweep range is phase-locked. | | | | | | | | | |
| | | Accuracy | Same as internal or external 10 MHz time base | | | | | | | | | |
| Resolution (Min. step size) | | 1 kHz (0.1 Hz with Option 11) | | | | | | | | | | |
| Steps | | Number of steps: Variable from 1 to 10000 Step size: 1 kHz (0.1 Hz with Option 11) to the full frequency range of the instrument. (If the step size does not divide into the selected frequency range, the last step is truncated.) | | | | | | | | | | |
| Dwell time per step | | Variable from 1 ms to 99 seconds | | | | | | | | | | |
| Switching time | | <15 ms + 1 ms/GHz step size or <40 ms, whichever is less (typical max.) | | | | | | | | | | |
| Alternate sweep mode | | Sweeps alternately between any two sweep ranges. Each sweep range may be associated with a different power level. | | | | | | | | | | |
| Manual sweep mode | | Provides stepped, phase-locked adjustment of frequency between sweep limits. User-selectable number of steps or step size. | | | | | | | | | | |
| Programmable frequency agility | | Under GPIB control, up to 1000 non-sequential frequencies can be stored and then addressed as a phase-locked step sweep. Data is stored in volatile memory. | | | | | | | | | | |
| Markers | Setting | Up to 20 independent, settable markers (F0 to F9 and M0 to M9) | | | | | | | | | | |
| | Video markers | +5 V or -5 V marker output, selectable. AUX I/O connector, rear panel | | | | | | | | | | |
| | Intensity markers | Produces an intensified dot on trace, obtained by momentary dwell in RF sweep | | | | | | | | | | |
| Spurious signals | Frequency range | 500 MHz to ≤ 2.2 GHz (500 MHz units) | 10 to 50 MHz (10 MHz units) | >50 MHz to ≤ 2 GHz (10 MHz units) | >2 to ≤ 20 GHz (2.2 to 500 MHz units) | >20 to ≤ 40 GHz | >40 to ≤ 50 GHz | >40 to ≤ 60 GHz | >40 to ≤ 45 GHz (65 GHz units) | >45 to ≤ 65 GHz (65 GHz units) | | |
| | Harmonic and harmonic related | <-50 dBc | <-30 dBc | <-40 dBc | <-60 dBc | <-40 dBc | - | - | - | - | | |
| | Harmonic and harmonic related ^{*2} | <-50 dBc | <-30 dBc | <-40 dBc | <-50 dBc | <-40 dBc | <-40 dBc | <-30 dBc | <-25 dBc | <-30 dBc | | |
| | Nonharmonic | <-40 dBc | | | | <-60 dBc | | | | | | |
| Spectral purity ^{*1} | Single-sideband phase noise, 69XXXX (dBc/Hz) | 69XXXX | | Offset from carrier | | | | | | | | |
| | | | | 100 Hz | 1 kHz | 10 kHz | 100 kHz | | | | | |
| | | 0.6 GHz (69XX5A) | | -92 | -112 | -112 | -117 | | | | | |
| | | 0.6 GHz | | -80 | -98 | -100 | -102 | | | | | |
| | | 2 GHz (69XX5B) | | -86 | -106 | -106 | -111 | | | | | |
| | | 2 GHz | | -80 | -100 | -100 | -105 | | | | | |
| | | 6 GHz | | -78 | -100 | -100 | -105 | | | | | |
| | | 10 GHz | | -74 | -98 | -100 | -105 | | | | | |
| | | 20 GHz | | -66 | -95 | -100 | -102 | | | | | |
| | | 26.5 GHz | | -63 | -91 | -94 | -96 | | | | | |
| | | 40 GHz | | -60 | -89 | -94 | -96 | | | | | |
| | | 50 GHz | | -57 | -83 | -88 | -90 | | | | | |
| | | 65 GHz | | -54 | -83 | -88 | -90 | | | | | |
| | | Single-sideband phase noise, 68XXXX (dBc/Hz) | 68XXXX | | Offset from carrier | | | | | | | |
| | | | 100 Hz | 1 kHz | 10 kHz | 100 kHz | | | | | | |
| 0.6 GHz (68XX5B) | | | -87 | -100 | -98 | -115 | | | | | | |
| 0.6 GHz | | | -77 | -88 | -86 | -100 | | | | | | |
| 2 GHz (68XX5B) | | | -81 | -94 | -92 | -109 | | | | | | |
| 2 GHz | | | -80 | -88 | -86 | -102 | | | | | | |
| 6 GHz | | | -78 | -88 | -86 | -102 | | | | | | |
| 10 GHz | | | -73 | -86 | -83 | -102 | | | | | | |
| 20 GHz | | | -66 | -78 | -78 | -100 | | | | | | |
| 26.5 GHz | | | -63 | -78 | -76 | -96 | | | | | | |
| 40 GHz | | | -60 | -75 | -72 | -94 | | | | | | |
| 50 GHz | | | -54 | -69 | -66 | -88 | | | | | | |
| 65 GHz | | | -54 | -69 | -64 | -88 | | | | | | |

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| Models | | Frequency range | Output power | Output power with step attenuator | |
|--------------|---|--|--|--|--------------------|
| Output power | 6XX37 | ≥2 to ≤20 GHz | +13 dBm | +11 dBm | |
| | 6XX45 | ≥0.5 to ≤20 GHz | +13 dBm | +11 dBm | |
| | 6XX47 | ≥0.01 to ≤20 GHz | +13 dBm | +11 dBm | |
| | 6XX53 | ≥2 to ≤20 GHz >20 to ≤26.5 GHz | +9 dBm +6 dBm | +7 dBm +3.5 dBm | |
| | 6XX59 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤26.5 GHz | +13 dBm +9 dBm +6 dBm | +11 dBm +7 dBm +3.5 dBm | |
| | 6XX63 | ≥2 to ≤20 GHz >20 to ≤40 GHz | +9 dBm +6 dBm | +7 dBm +3 dBm | |
| | 6XX69 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤40 GHz | +13 dBm +9 dBm +6 dBm | +11 dBm +7 dBm +3 dBm | |
| | 6XX77 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤40 GHz >40 to ≤50 GHz | +12 dBm +10 dBm +2.5 dBm +2.5 dBm | +10 dBm +8.5 dBm 0 dBm -1 dBm | |
| | 6XX87 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤40 GHz >40 to ≤50 GHz >50 to ≤60 GHz | +12 dBm +10 dBm +2.5 dBm +2 dBm +2 dBm | +10 dBm +8.5 dBm 0 dBm -1.5 dBm -2 dBm | |
| | 6XX97 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤40 GHz >40 to ≤50 GHz >50 to ≤65 GHz | +12 dBm +10 dBm +2.5 dBm 0 dBm -2 dBm | - | |
| | With Option 15 (high power) installed | 6XX37 | ≥2 to ≤20 GHz | +17 dBm | +15 dBm |
| | | 6XX45 | ≥0.5 to ≤2.2 GHz >2.2 to ≤20 GHz | +13 dBm +17 dBm | +11 dBm +15 dBm |
| | | 6XX47 | ≥0.01 to <2 GHz ≥2 to ≤20 GHz | +13 dBm +17 dBm | +11 dBm +15 dBm |
| 6XX53 | | ≥2 to <20 GHz ≥20 to ≤26.5 GHz | +13 dBm +10 dBm | +11 dBm +7.5 dBm | |
| 6XX59 | | ≥0.01 to <2 GHz ≥2 to ≤20 GHz >20 to ≤26.5 GHz | +13 dBm +13 dBm +10 dBm | +11 dBm +11 dBm +7.5 dBm | |
| 6XX63 | | ≥2 to ≤20 GHz >20 to ≤40 GHz | +13 dBm +6 dBm | +11 dBm +3 dBm | |
| 6XX69 | | ≥0.01 to ≤20 GHz >20 to ≤40 GHz | +13 dBm +6 dBm | +11 dBm +3 dBm | |

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|-----------------------------|--|---|---|--|----------------|--------------|--------------|--------------|--------------|--|
| RF output | Levelled output power range | Without an attenuator | Maximum levelled power to -15 dBm (-20 dBm typical). For units with Option 15 installed, minimum settable power is -5 dBm (-10 dBm typical). | | | | | | | |
| | | With an attenuator | Maximum levelled power to -115 dBm (-120 dBm typical). For units with upper limit ≥ 50 GHz and units with Option 15 installed, minimum settable power is -105 dBm (-110 dBm typical). | | | | | | | |
| | Unlevelled output power range (typical) | Without an attenuator | >40 dB below max power | | | | | | | |
| | | With an attenuator | >130 dB below max power | | | | | | | |
| | Power level switching time (to within specified accuracy) | Without change in step attenuator | <1 ms typical | | | | | | | |
| | | With change in step attenuator | <20 ms typical | | | | | | | |
| | Accuracy and flatness (step sweep and CW modes) | Accuracy | Attenuation below max power | 0.01 to 0.05 GHz | 0.05 to 20 GHz | 20 to 40 GHz | 40 to 50 GHz | 50 to 60 GHz | 60 to 65 GHz | |
| | | | 0 to 25 dB | ± 2.0 dB | ± 1.0 dB | ± 1.0 dB | ± 1.5 dB | ± 1.5 dB | ± 1.5 dB | |
| | | | 25 to 60 dB | ± 2.0 dB | ± 1.0 dB | ± 1.0 dB | ± 1.5 dB | ± 3.5 dB | – | |
| | | Flatness | >60 dB | ± 2.0 dB | ± 1.0 dB | ± 1.0 dB | ± 2.5 dB | ± 3.5 dB | – | |
| | | | 0 to 25 dB | ± 2.0 dB | ± 0.8 dB | ± 0.8 dB | ± 1.1 dB | ± 1.1 dB | ± 1.1 dB | |
| | | | 25 to 60 dB | ± 2.0 dB | ± 0.8 dB | ± 0.8 dB | ± 1.1 dB | ± 3.1 dB | – | |
| | >60 dB | ± 2.0 dB | ± 0.8 dB | ± 0.8 dB | ± 2.1 dB | ± 3.1 dB | – | | | |
| | Output power resolution | 0.01 dB | | | | | | | | |
| Level offset | Offsets the displayed power level to establish a new reference level | | | | | | | | | |
| CW power sweep | Range | Sweeps between any two power levels at a single CW frequency | | | | | | | | |
| | Resolution | 0.01 dB/step | | | | | | | | |
| | Accuracy | Same as CW power accuracy | | | | | | | | |
| | Step size | User-controlled, 0.01 dB to the full power range of the instrument | | | | | | | | |
| | Step dwell time | Variable from 1 ms to 99 seconds. If the sweep crosses a step attenuator setting, there will be a sweep dwell of approximately 20 ms to allow setting of the step attenuator. | | | | | | | | |
| Sweep frequency/step power | A power level step occurs after each frequency sweep. Power level remains constant for length of time required to complete each sweep. | | | | | | | | | |
| 69100A/68100B modulation | Amplitude modulation | External AM input | Log AM or linear AM input, front or rear-panel BNC, 50 Ω or 600 Ω input impedance All options selectable from modulation menu | | | | | | | |
| | | AM sensitivity | Log AM: Continuously variable from 0 to 25 dB/V Linear AM: Continuously variable from 0 to 100%/V | | | | | | | |
| | | AM depth | 0 to 90% linear, 20 dB log (typical with RF level at 6 dB below maximum rated output) | | | | | | | |
| | | AM bandwidth (3 dB) | DC to 50 kHz minimum (DC to 100 kHz typical) | | | | | | | |
| | | Maximum input | ± 1 V | | | | | | | |
| | Frequency modulation | External FM input | Front or rear panel BNC, 50 Ω or 600 Ω input impedance. All options selectable from modulation menu | | | | | | | |
| | | FM sensitivity | Variable from ± 10 kHz/V to ± 20 MHz/V (narrow FM modes) or from ± 100 kHz/V to ± 100 MHz/V (wide FM mode)* ³ | | | | | | | |
| | | Deviation | Narrow mode: ± 10 MHz, DC to 500 kHz rates Wide mode: ± 100 MHz, DC to 100 Hz rates Locked mode: The lesser of ± 10 MHz or rate x 300, 1 to 500 kHz rates | | | | | | | |
| | Square wave modulation* ⁴ | On/off ratio | >50 dB | | | | | | | |
| | | Rise/fall time | <1 μ s typical | | | | | | | |
| | | Internal square wave generator | Four square wave signals (400 Hz, 1 kHz, 7.8125 kHz, and 27.8 kHz), selectable from modulation menu Accuracy: Same as internal or external 10 MHz time base Square wave symmetry: 50% $\pm 5\%$ at all power levels | | | | | | | |
| | | External input | Front or rear-panel BNC, selectable from modulation menu Drive level: TTL compatible input Minimum pulse width: >5 μ s Input logic: Positive-true or negative-true BNC, selectable from modulation menu | | | | | | | |
| | 69200A/69300A/68200B/68300B modulation | Amplitude modulation* ⁵ | External AM input | Log AM or linear AM input, front or rear-panel BNC, 50 Ω or 600 Ω input impedance All options selectable from modulation menu | | | | | | |
| | | | AM sensitivity | Log AM: Continuously variable from 0 to 25 dB per volt Linear AM: Continuously variable from 0 to 100% per volt | | | | | | |
| AM depth (typical) | | | 0 to 90% linear; 20 dB log | | | | | | | |
| AM bandwidth | | | DC to 50 kHz minimum (DC to 100 kHz typical) | | | | | | | |
| Flatness | | | ± 0.3 dB (DC to 10 kHz rates) | | | | | | | |
| Accuracy | | | $\pm 5\%$ | | | | | | | |
| Distortion | | | $<5\%$ typical | | | | | | | |
| Incidental phase modulation | | | <0.2 radians (30% depth, 10 kHz rate) | | | | | | | |
| Maximum input | | | ± 1 V | | | | | | | |

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| 69200A/69300A/68200B/68300B modulation | Internal AM generator | Waveforms | Sinusoid, squarewave, triangle, positive ramp, negative ramp, Gaussian noise, uniform noise, user defined (Option 10) |
| | | Rate | 0.1 Hz to 1 MHz sinusoidal, 0.1 Hz to 100 kHz squarewave, triangle, ramps |
| | | Resolution | 0.1 Hz |
| | | Accuracy | Same as instrument timebase |
| | | Output | BNC connector, rear panel |
| | Frequency modulation | External FM input | Front or rear panel BNC, 50 Ω or 600 Ω input impedance All options selectable from modulation menu |
| | | FM sensitivity | Continuously variable from ±10 kHz per volt to ±20 MHz per volt (locked, locked low noise and unlocked narrow modes), or ±100 kHz per volt to ±100 MHz per volt (unlocked wide mode) For 500 MHz units, maximum sensitivity is divided by 2 from 1 to 2.2 GHz and is divided by 4 from 500 MHz to 1 GHz. |
| | | Deviation | Unlocked wide: ±100 MHz, DC to 100 Hz rates Unlocked narrow: ±10 MHz, DC to 8 MHz rates Locked: The lesser of ±10 MHz or rate x 300, 1 kHz to 8 MHz rates Locked low noise: The lesser of ±10 MHz or rate x 3, 50 kHz to 8 MHz rates |
| | | FM bandwidth (3 dB) | Unlocked wide: DC to 100 Hz Unlocked narrow: DC to 10 MHz Locked: 1 kHz to 10 MHz Locked low noise: 30 kHz to 10 MHz |
| | | Flatness | ±1 dB (10 kHz to 1 MHz rates) |
| | | Accuracy | 10% (5% typical, ±200 kHz deviation, 100 kHz rate) |
| | | Incidental AM | <2% (±1 MHz deviation, 1 MHz rate) |
| | | Harmonic distortion | <1% (±1 MHz deviation, 10 kHz rate) |
| | | Maximum input | ±1 V |
| | Internal FM generator | Waveforms | Sinusoid, squarewave, triangle, positive ramp, negative ramp, Gaussian noise, uniform noise, user defined (Option 10) |
| | | Rate | 0.1 Hz to 1 MHz sinusoidal, 0.1 Hz to 100 kHz squarewave, triangle, ramps |
| | | Resolution | 0.1 Hz |
| | | Accuracy | Same as instrument timebase |
| | | Output | BNC connector, rear panel |
| | Phase modulation (øM, Option 6) | øM deviation | Narrow mode (DC to 8 MHz rates): The lesser of ±3 radians or ±5 MHz/rate Wide mode (DC to 1 MHz rates): The lesser of ±400 radians or ±10 MHz/rate. For 6XXX5 units, maximum deviation is divided by 2 from >1.0 to ≤2.2 GHz and is divided by 4 from ≥0.5 to <1.0 GHz. |
| | | øM bandwidth (3 dB, relative to 100 kHz rate) | Narrow mode: DC to 10 MHz Wide mode: DC to 1 MHz |
| | | øM flatness (relative to 100 kHz rate) | Narrow mode (DC to 1 MHz rates): ±1 dB Wide mode (DC to 500 kHz rates): ±1 dB |
| | | øM accuracy | 10% (at 100 kHz sine wave) |
| | | External øM input | Front or rear panel BNC (shares the FM input), 50 Ω or 600 Ω input impedance. All options selectable from modulation menu. Shares connectors with FM. |
| | | External øM sensitivity | Continuously variable from ±0.0025 to ±5 radians per volt (narrow øM mode) or ±0.25 to ±500 radians per volt (wide øM mode), selectable from modulation menu. For 6XXX5 units, maximum sensitivity is divided by 2 from >1 to ≤2.2 GHz and is divided by 4 from ≥0.5 to <1 GHz. |
| | | External øM maximum input | ±1 V |
| | Internal øM generator (shares the internal FM generator) | Waveforms | Sine, square, triangle, positive ramp, negative ramp, Gaussian noise, uniform noise, user defined (option 10) |
| | | Rate | 0.1 Hz to 1 MHz for sine wave, 0.1 Hz to 100 kHz for other waveforms |
| Resolution | | 0.1 Hz | |
| Accuracy | | Same as instrument timebase | |
| Output | | BNC connector, rear panel | |
| Pulse modulation**6 | On/off ratio | >80 dB | |
| | Rise/fall time (10 to 90%) | <10 ns (<5 ns typical). (for 6XXX5 units, rise/fall time below 1 GHz is 15 ns) | |
| | Minimum levelled pulse width | <100 ns (≥2 GHz), <1 μs (<2 GHz) | |
| | Minimum unleveled pulse width | <10 ns | |
| | Pulse overshoot | <10% (for 60 and 65 GHz units, overshoot from 40 to 60 GHz is 20% typical) | |
| | Level accuracy relative to CW | ±0.5 dB (≥1 μs pulse width), ±1.0 dB (<1 μs pulse width) 100 Hz to 1 MHz PRF | |

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|-------------------------------|--|---|---|------------------|-----------------|--|
| 69200A/69300A modulation | Pulse modulation*6 | Video feedthrough | <±10 mV, ≥2 GHz | | | |
| | | Pulse width compression | <8 ns typical | | | |
| | | Pulse delay (typical) | External mode: 50 ns Triggered mode: 100 ns Triggered with delay mode: 200 ns | | | |
| | | PRF range | DC to 10 MHz unlevelled, 100 Hz to 5 MHz levelled | | | |
| | | External input | Front or rear-panel BNC, selectable from modulation menu Drive level: TTL compatible input Input logic: Positive-true or negative-true, selectable from modulation menu | | | |
| | Internal pulse generator | Frequency (selectable clock rate) | 40 MHz | 10 MHz | | |
| | | Pulse width | 25 ns to 419 ms | 100 ns to 1.6 s | | |
| | | Pulse period | 250 ns to 419 ms | 600 ns to 1.6 s | | |
| | | Variable delay | Singlet | 0 to 419 ms | 0 to 1.6 s | |
| | | | Doublet | 100 ns to 419 ms | 300 ns to 1.6 s | |
| | | | Triplet | 100 ns to 419 ms | 300 ns to 1.6 s | |
| | | | Quadruplet | 100 ns to 419 ms | 300 ns to 1.6 s | |
| | | Resolution | 25 ns | 100 ns | | |
| | Modes | Free-run, triggered, gated, delayed, singlet, doublet, triplet, quadruplet | | | | |
| | Accuracy | 10 ns (5 ns typical) | | | | |
| | Outputs | Video pulse and sync out, rear-panel BNC connectors | | | | |
| | SCAN modulator (Option 20, 6X237, 6X245, 6X247, 6X337, 6X345 and 6X347 only) | Frequency range | 1 to 20 GHz | | | |
| | | Attenuation range*7 | 0 to 60 dB | | | |
| | | Flatness | ±2 dB (0 to 40 dB), ±3.5 dB (40 to 60 dB) | | | |
| | | Step response | <1 μs | | | |
| Sensitivity | | -10 dB/V | | | | |
| Insertion loss (when engaged) | | <6 dB (1 to 18 GHz), <8 dB (18 to 20 GHz) | | | | |
| Input | | Rear-panel BNC (f) connector | | | | |
| Remote operation*8 | GPIB address | Selectable from a system menu | | | | |
| | IEEE-488 interface function subset | SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT1, C0, C1, C2, C3, C28, E2 | | | | |
| | Emulations | The instrument responds to the published GPIB commands and responses of the models 6XX00-series signal sources. When emulating another signal source, the instrument is limited to the capabilities, mnemonics, and parameter resolutions of the emulated instrument. | | | | |
| General | Stored setups | Stores front panel settings and nine additional front-panel setups in a non-volatile RAM. A system menu allows saving and recalling of instrument setups. Whenever the instrument is turned on, control settings come on at the same functions and values existing when the instrument was turned off. | | | | |
| | Memory sequencing input | Accepts a TTL low-level signal to sequence through nine stored setups. AUX I/O connector, rear panel | | | | |
| | Self-test | Instrument self-test is performed when SELF TEST soft-key is selected. If an error is detected, an error message is displayed in a window on the LCD identifying the probable cause. | | | | |
| | Secure mode | Disables all frequency, power level, and modulation state displays. Stored setups saved in secure mode remain secured when recalled. Mode selectable from a system menu and GPIB | | | | |
| | Reset | Returns instrument parameters to predefined default states or values. Any pending GPIB I/O is aborted. Selectable from the system menu | | | | |
| | Master/slave operation | Allows two 68X00B output signals to be swept with a user-selected frequency offset. One 68X00B unit controls the other via AUX I/O and SERIAL I/O connections. Requires MASTER/SAVE interface cable set (part no. ND36329) | | | | |
| | User level flatness correction | Allows user to calibrate out path loss due to external switching and cables via entered power table from a GPIB power meter or calculated data. When user level correction is activated, entered power levels are delivered at the point where calibration was performed. Supported power meters are Anritsu ML4803A and HP437B, 438A, and 70100A. Five user tables are available at up to 801 points/table | | | | |
| | Warm up time (standard time base) | From standby: 30 minutes From cold start (0<): 120 hours to achieve <2 x 10 ⁻⁸ /day frequency stability | | | | |
| | Warm up time (option 16 time base) | From standby: 30 minutes From cold start (0<): 72 hours to achieve <5 x 10 ⁻¹⁰ /day frequency stability | | | | |
| | Power | 90 to 132 Vac or 180 to 264 Vac, 49 to 440 Hz, ≤400 VA | | | | |
| | Standby | With ac line power connected, unit is placed in standby when front panel power switch is released from the OPERATE position | | | | |
| | Dimensions and mass | 429 (W) x 133 (H) x 597 (D) mm [5.25 (H) x 16.875 (W) x 23.5 (D) in.], ≤23 kg (50 lb) | | | | |
| | RF output connector | Type K female (≤40 GHz models), Type V female (>40 GHz models) | | | | |

*1: All specifications apply to the phase-locked CW and step sweep modes at the lesser of +10 dBm output or maximum specified levelled output power, unless otherwise noted.

*2: >40 GHz units and units with Option 15 at maximum specified levelled output power

*3: For 6x1x5 units, maximum sensitivity is divided by 2 from 1 to 2.2 GHz and is divided by 4 from 500 MHz to 1 GHz.

*4: The RF output can be pulse modulated via an external modulating signal or an internal square wave generator

*5: All amplitude modulation specifications apply at 50% depth, 1 kHz rate, with RF level set 6 dB below maximum specified levelled output power, unless otherwise noted

*6: All pulse modulation specifications apply at maximum specified levelled output power, unless otherwise noted

*7: Maximum attenuation = attenuation ±flatness

*8: All instrument functions, settings, and operating modes (except for power on/standby) are controllable using commands sent from an external computer via the GPIB (IEEE-488 interface bus).

Ordering Information

Please specify model/order number, name, and quantity when ordering.

| Model/Order No. | Name |
|-------------------|---|
| Main frame | |
| 69037A | Ultra Low Noise Synthesized CW Generator (2 to 20 GHz)*1 |
| 69045A | Ultra Low Noise Synthesized CW Generator (500 MHz to 20 GHz)*1 |
| 69047A | Ultra Low Noise Synthesized CW Generator (10 MHz to 20 GHz)*1 |
| 69053A | Ultra Low Noise Synthesized CW Generator (2 to 26.5 GHz)*1 |
| 69059A | Ultra Low Noise Synthesized CW Generator (10 MHz to 26.5 GHz)*1 |
| 69063A | Ultra Low Noise Synthesized CW Generator (2 to 40 GHz)*1 |
| 69069A | Ultra Low Noise Synthesized CW Generator (10 MHz to 40 GHz)*1 |
| 69077A | Ultra Low Noise Synthesized CW Generator (10 MHz to 50 GHz)*2 |
| 69087A | Ultra Low Noise Synthesized CW Generator (10 MHz to 60 GHz)*2 |
| 69097A | Ultra Low Noise Synthesized CW Generator (10 MHz to 65 GHz)*2 |
| 69137A | Ultra Low Noise Synthesized Sweep Generator (2 to 20 GHz)*1 |
| 69145A | Ultra Low Noise Synthesized Sweep Generator (500 MHz to 20 GHz)*1 |
| 69147A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 20 GHz)*1 |
| 69153A | Ultra Low Noise Synthesized Sweep Generator (2 to 26.5 GHz)*1 |
| 69159A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 26.5 GHz)*1 |
| 69163A | Ultra Low Noise Synthesized Sweep Generator (2 to 40 GHz)*1 |
| 69169A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 40 GHz)*1 |
| 69177A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 50 GHz)*2 |
| 69187A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 60 GHz)*2 |
| 69197A | Ultra Low Noise Synthesized Sweep Generator (10 MHz to 65 GHz)*2 |
| 69237A | Ultra Low Noise Synthesized Signal Generator (2 to 20 GHz)*1 |
| 69245A | Ultra Low Noise Synthesized Signal Generator (500 MHz to 20 GHz)*1 |
| 69247A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 20 GHz)*1 |
| 69253A | Ultra Low Noise Synthesized Signal Generator (2 to 26.5 GHz)*1 |
| 69259A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 26.5 GHz)*1 |
| 69263A | Ultra Low Noise Synthesized Signal Generator (2 to 40 GHz)*1 |
| 69269A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 40 GHz)*1 |
| 69277A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 50 GHz)*2 |
| 69287A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 60 GHz)*2 |
| 69297A | Ultra Low Noise Synthesized Signal Generator (10 MHz to 65 GHz)*2 |
| 69337A | Ultra Low Noise Synthesized Sweep/Signal Generator (2 to 20 GHz)*1 |
| 69345A | Ultra Low Noise Synthesized Sweep/Signal Generator (500 MHz to 20 GHz)*1 |
| 69347A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 20 GHz)*1 |
| 69353A | Ultra Low Noise Synthesized Sweep/Signal Generator (2 to 26.5 GHz)*1 |
| 69359A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 26.5 GHz)*1 |
| 69363A | Ultra Low Noise Synthesized Sweep/Signal Generator (2 to 40 GHz)*1 |
| 69369A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 40 GHz)*1 |
| 69377A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 50 GHz)*2 |
| 69387A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 60 GHz)*2 |
| 69397A | Ultra Low Noise Synthesized Sweep/Signal Generator (10 MHz to 65 GHz)*2 |

| Model/Order No. | Name |
|-----------------|---|
| 68037B | Synthesized CW Generator (2 to 20 GHz)*1 |
| 68045B | Synthesized CW Generator (500 MHz to 20 GHz)*1 |
| 68047B | Synthesized CW Generator (10 MHz to 20 GHz)*1 |
| 68053B | Synthesized CW Generator (2 to 26.5 GHz)*1 |
| 68059B | Synthesized CW Generator (10 MHz to 26.5 GHz)*1 |
| 68063B | Synthesized CW Generator (2 to 40 GHz)*1 |
| 68069B | Synthesized CW Generator (10 MHz to 40 GHz)*1 |
| 68077B | Synthesized CW Generator (10 MHz to 50 GHz)*2 |
| 68087B | Synthesized CW Generator (10 MHz to 60 GHz)*2 |
| 68097B | Synthesized CW Generator (10 MHz to 65 GHz)*2 |
| 68137B | Synthesized Sweep Generator (2 to 20 GHz)*1 |
| 68145B | Synthesized Sweep Generator (500 MHz to 20 GHz)*1 |
| 68147B | Synthesized Sweep Generator (10 MHz to 20 GHz)*1 |
| 68153B | Synthesized Sweep Generator (2 to 26.5 GHz)*1 |
| 68159B | Synthesized Sweep Generator (10 MHz to 26.5 GHz)*1 |
| 68163B | Synthesized Sweep Generator (2 to 40 GHz)*1 |
| 68169B | Synthesized Sweep Generator (10 MHz to 40 GHz)*1 |
| 68177B | Synthesized Sweep Generator (10 MHz to 50 GHz)*2 |
| 68187B | Synthesized Sweep Generator (10 MHz to 60 GHz)*2 |
| 68197B | Synthesized Sweep Generator (10 MHz to 65 GHz)*2 |
| 68237B | Synthesized Signal Generator (2 to 20 GHz)*1 |
| 68245B | Synthesized Signal Generator (500 MHz to 20 GHz)*1 |
| 68247B | Synthesized Signal Generator (10 MHz to 20 GHz)*1 |
| 68253B | Synthesized Signal Generator (2 to 26.5 GHz)*1 |
| 68259B | Synthesized Signal Generator (10 MHz to 26.5 GHz)*1 |
| 68263B | Synthesized Signal Generator (2 to 40 GHz)*1 |
| 68269B | Synthesized Signal Generator (10 MHz to 40 GHz)*1 |
| 68277B | Synthesized Signal Generator (10 MHz to 50 GHz)*2 |
| 68287B | Synthesized Signal Generator (10 MHz to 60 GHz)*2 |
| 68297B | Synthesized Signal Generator (10 MHz to 65 GHz)*2 |
| 68337B | Synthesized Sweep/Signal Generator (2 to 20 GHz)*1 |
| 68345B | Synthesized Sweep/Signal Generator (500 MHz to 20 GHz)*1 |
| 68347B | Synthesized Sweep/Signal Generator (10 MHz to 20 GHz)*1 |
| 68353B | Synthesized Sweep/Signal Generator (2 to 26.5 GHz)*1 |
| 68359B | Synthesized Sweep/Signal Generator (10 MHz to 26.5 GHz)*1 |
| 68363B | Synthesized Sweep/Signal Generator (2 to 40 GHz)*1 |
| 68369B | Synthesized Sweep/Signal Generator (10 MHz to 40 GHz)*1 |
| 68377B | Synthesized Sweep/Signal Generator (10 MHz to 50 GHz)*2 |
| 68387B | Synthesized Sweep/Signal Generator (10 MHz to 60 GHz)*2 |
| 68397B | Synthesized Sweep/Signal Generator (10 MHz to 65 GHz)*2 |

Continued on next page

| Model/Order No. | Name |
|-----------------|--|
| | Options |
| Option 1 | Rack mounting kit, includes one set of track slides (90° tilt capability), mounting ears, and front panel handles for mounting in a standard 19-inch equipment rack |
| Option 2A | Step attenuator (10 dB/step, high-end frequency of ≤26.5 GHz, rated output power is reduced) |
| Option 2B | Step attenuator (10 dB/step, high-end frequency of ≤40 GHz, rated output power is reduced) |
| Option 2C | Step attenuator (10 dB/step, high-end frequency of ≤50 GHz, rated output power is reduced) |
| Option 2D | Step attenuator (10 dB/step, high-end frequency of ≤60 GHz, rated output power is reduced) |
| Option 6 | Phase modulation capability FM input and FM generator become FM/øM input and FM/øM generator (69200A, 68200B, 69300A and 68300B series) Not available with option 7 |
| Option 7 | Generators deletes the internal AM and FM generators (69200A, 68200B, 69300A and 68300B series). External AM and FM capability remains unchanged. Not available in combination with Option 6, 8, 10 or 20 |
| Option 8 | Internal power meter adds an internal power (69200A, 68200B, 69300A and 68300B series) compatible with 560-7, 5400-7, or 6400-71 series detectors. Not available with Option 7 |
| Option 9 | Rear panel RF output (moves RF output connector to the rear panel) |
| Option 10 | Complex modulation (user defined modulation includes serial cable and Windows® based software) (69200A, 68200B, 69300A and 68300B series) (*Not available with Option 7) |
| Option 11 | 0.1 Hz frequency resolution (provides frequency resolution of 0.1 Hz) |
| Option 14 | Wiltron 360B VNA compatibility (modifies rack mounting hardware to mate unit in Wiltron 360B VNA console) |
| Option 15 | High power output (provides high-power from 2 to 26.5 GHz) |
| Option 16 | High stability time base (adds an ovenized, 10 MHz crystal oscillator as a high-stability time base) |
| Option 17 | Delete front panel (deletes the front panel for use in remote control applications where a front panel display and keyboard control are not needed) |
| Option 18 | MM-wave bias (rear panel bias output to drive 54000-XX WRXX multiplier. BNC twinax: not available with Option 20) |
| Option 19 | SCPI programmability adds GPIB command mnemonics complying with Standard Commands for Programmable Instruments (SCPI), Version 1993.0. SCPI programming complies with IEEE 488.2–1987 |
| Option 20 | SCAN modulator (adds an internal SCAN modulator for simulating high-depth amplitude modulated signals in models 68237B, 68337B, 68247B and 68347B only. Requires an external modulating signal input: not available in combination with Option 7 or Option 18) |

| Model/Order No. | Name |
|-----------------|--|
| | Accessories |
| 34RKNF50 | Ruggedized K-to-Type N Female Adapter (DC to 20 GHz) |
| 34VKF50 | V Male-to-K Female (DC to 46 GHz) |
| 34RVNF50 | Ruggedized V-to-Type N Female Adapter (DC to 20 GHz) |
| ND36329 | MASTER/SLAVE interface cable |
| 761-69 | Protective front panel cover |
| 760-177 | Transit case |
| 2300-16 | 69100A/68100B/68100A instrument driver for national instruments LabWindows® Ver. 2.2 |
| 2300-19 | 69200A/68200B/68300B instrument driver for national instruments LabWindows® Ver. 2.2 |
| 2300-20 | 69000A/68000B instrument driver for national instruments LabWindows® Ver. 2.2 |

*1: K female output connector

*2: V female output connector